WEATHER NOTE

NIGHTTIME TEMPERATURE RISES IN MOUNTAIN CANYONS

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"Is it true that in Cochiti Canyon (northern New Mexico) the temperature frequently rises as much as 20° around midnight?" This question was asked some time ago and in my reply I pointed out that we had no actual records that would substantiate such a temperature rise and that such rises would probably occur only under certain rather rare meteorological conditions.

In late 1958 a thermograph was installed at the climatological substation at Tijeras Ranger Station and we now have a year's thermograph record for that station. The Tijeras Ranger Station is located in Cedro Canyon in the Manzano mountains, some 15 miles east of Albuquerque. The maximum and minimum thermometers and the thermograph are exposed in a standard instrument

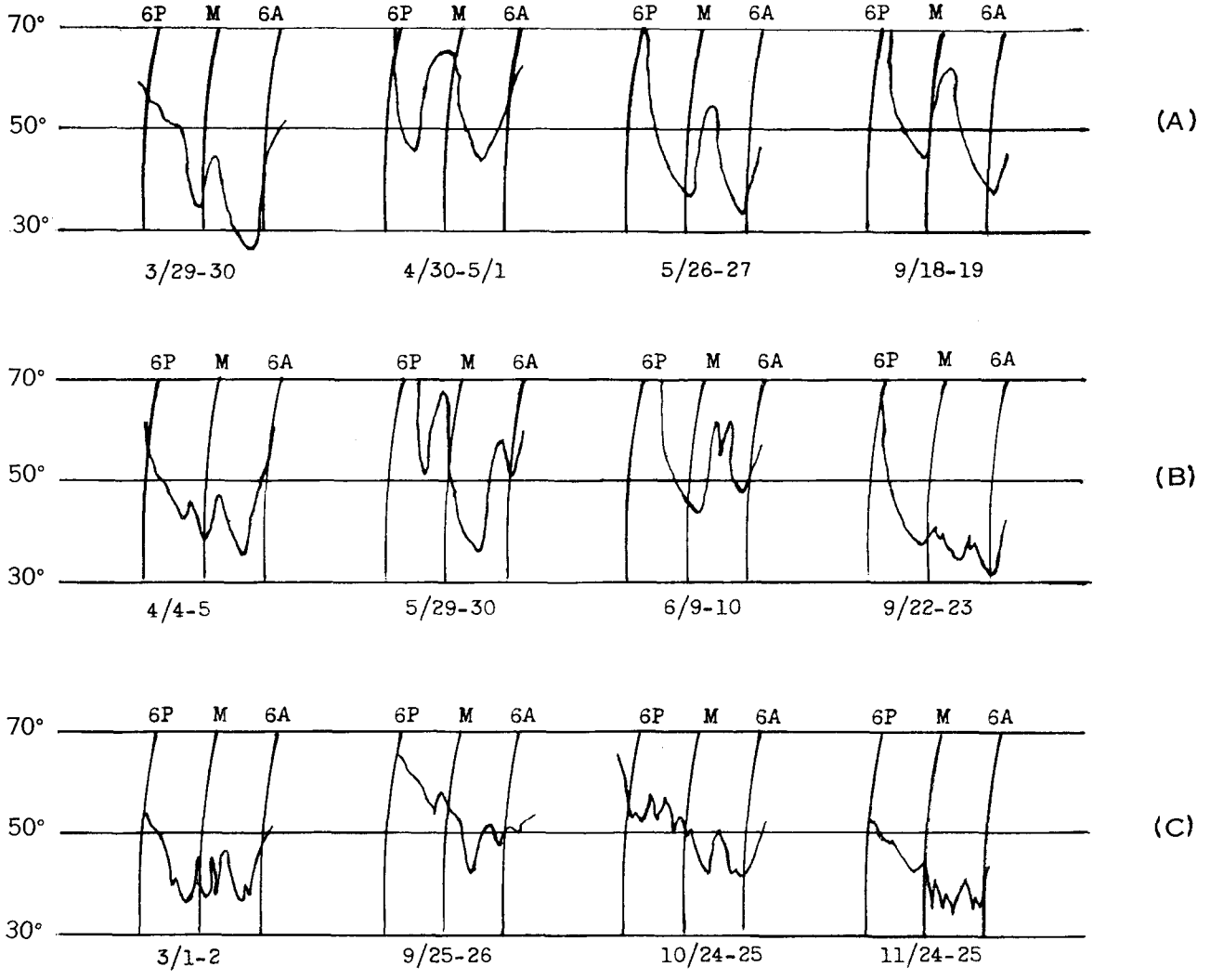

FIGURE 1.—Tracings of thermograph records made at Tijeras Ranger Station, N. Mex., during 1959, showing nighttime temperature rises.

shelter in an open site on the floor of the canyon at an elevation of 6,300 feet above sea level. Cedro Canyon, running in a general south to north direction, is a narrow, winding canyon with mountain ridges some 1,000 to 2,000 feet higher, paralleling either side. There is a fall of about 800 feet from the head of the canyon to the site of the station, a distance of some 4 miles in a straight line. The station is about one-half mile from the mouth of the canyon where it joins Tijeras Canyon. This latter canyon runs from northeast to southwest and opens onto the wide Rio Grande Valley just east of Albuquerque and about 10 miles below the confluence of the two canyons.

A review of the thermograph traces for the Tijeras Ranger Station shows a nighttime temperature rise and subsequent fall on approximately 42 percent of the days in 1959. This rise and fall in temperature during the night may vary from a few degrees to an abrupt change of as much as 20°. In figure 1 are reproduced nighttime thermograph traces for some of the more typical cases. Group (a) illustrates a single rise in temperature of considerable magnitude occurring near midnight. The period of higher temperature may last from 1 to several hours and then the temperature falls rapidly to a point that might be expected if the nighttime temperature had followed a normal diurnal curve. In group (b) two separate rises in temperature followed by falls are indicated during the night, representing two distinct and separate periods when local conditions resulted in a temperature change. In group (c) frequent temperature fluctuations are indicated illustrating the effect of numerous variations in the local conditions which produce these changes.

Wind and sky cover records are not available for the Tijeras Ranger Station but it is believed that the temperature rises are associated with air drainage and mountain-valley breezes which spring up during the night and for varying periods of time wipe out the usual nighttime valley inversions. It would also seem from groups (b) and (c) on the chart that at times these breezes are quite erratic, occasionally increasing and dying out several times during the night. A review of the weather records at Albuquerque did not show any definite type of weather associated with the temperature variations illustrated. Generally the nights at Albuquerque were clear, although on one occasion high broken to overcast sky conditions prevailed throughout the night. Winds at Albuquerque on the nights examined were generally light and variable, although on 2 nights south to southeast winds up to 20 knots were recorded.

The thermograph records at least prove that at Tijeras Ranger Station near midnight temperature rises do occur. It would seem entirely within reason that similar nighttime temperature changes also occur in Cochiti Canyon and probably in many other mountain canyons throughout the West.